

Notes on the Food of Tanypodinae Larvae^{1,2}SELWYN S. ROBACK^{3,4}

The larvae of the Tanypodinae often have been reported as being predaceous (Leathers, 1922; Wesenberg-Lund, 1943; Morgan, 1949; Belyaskaya and Konstantinov, 1956). Leathers mentions the ability of these larvae to suck fluid from their prey. This permits their predation on organisms too large to swallow whole. Morgan discusses the mechanism enabling these larvae to ingest whole organisms and also notes their capability of using algae as food. Armitage (1968) considered that for smaller larvae, *Procladius choreus*, *Pr. nudipennis* and *Ablabesmyia monilis*, size group 2 (4-7 mm) algae was the most important food during the spring and autumn while detritus was the most important food under ice cover. For larger larvae *Pr. signatus*, *Pr. nigricentris* and *Pr. flavifrons*, size group 1 (7-11 mm), faunal and detritus food was preferred earlier and detritus was most common under ice cover. As Armitage mentions, more work is needed to test the significance of algae as food for the Tanypodinae.

Much work on the precise feeding of Tanypodinae larvae has been done by the Russian workers, Konstantinov and Luferov. Unfortunately all their work has been done only on the species of the genera *Procladius* and *Ablabesmyia*. Konstantinov (1961) lists chironomids, oligochaetes and plankton crustacea, in that order, as the preferred food for both genera. The results here indicate that Cladocera and chironomids, in that order, are the most important for *Procladius* spp. and chironomids and Cladocera for *Ablabesmyia* spp. The results of Luferov (1957, 1958, 1961) are more in accord with the results here. He lists for *Procladius* spp.: 7 species of Tendipedidae, 11 Entomostraca, 3 Oligochaeta; for *Ablabesmyia* spp.: 9 species of Tendipedidae, 5 Entomostraca, 1 Oligochaeta and 1 mite. Entomostraca as used by Luferov includes Cyclopoid Copepoda, Ostracoda and Cladocera.

This report is based on the slide mounted specimens in the collection of the Academy of Natural Sciences of Philadelphia. In all, the intestinal contents of about 310 specimens from over 10 genera of Tanypodinae were examined. The Tanypodini are not included but are discussed in another paper now in press.

¹ Diptera, Chironomidae.

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In the lists that follow, the number in boldface after each genus or species gives the number of specimens examined. The boldface numbers after the food categories give the number of specimens in which the particular food species or genus was found, while the number preceding this indicates the number of specimens of the particular food species or category which were found. For example, in the Coelotanypodini, 15 specimens of *Coelotanypus* sp. were examined, 5 of these contained 7 specimens of Chironomidae and 2 of these 5 contained 3 specimens of *Polypedilum*. No attempt was made to count the numbers of diatoms or desmids and a count of the Oligochaeta was impossible. The classification of invertebrates used is as in 2nd Edition of "Fresh Water Biology" (Edmondson, 1959).

THE FOOD OF TANYPODINAE LARVAE

Diatomaceae.—Almost all genera examined contained diatoms, in varying concentrations, in their digestive tracts. Some evidence indicates these are an important food component (Armitage, 1968) but in the specimens examined there was no way to be sure that they were alive when ingested. Some may be taken along with debris as the larvae browses through the bottom or over vegetation in search of food. Their concentration might depend on whether the larva was living in shallower water where conditions for diatom growth were good or was moving through an area of frustule deposition. The species of the genus *Procladius* had the greatest percentage of larvae with diatoms (95%), while the species, *Pentaneurini* sp. E with 23%, was lowest. Both centric and pennate diatoms were present.

Desmuidaceae.—The comments under diatoms apply equally well here. Specimens from pond situations had a greater concentration of desmids in their digestive tracts.

Protozoa.—Only the case forming Testacea were observed. They were of sporadic occurrence and cannot be considered significant as food.

Rotifera.—These are normally quite abundant in slower water and may be more significant as food than the meager records would indicate. The body parts are probably ground up by the diatoms and sand in the digestive tracts of the Tanypodinae larvae and cannot be distinguished. A loricate rotifer, *Monostyla*, was the only one found.

Tardigrada.—Only one specimen was found (at best these are rare animals), tentatively identified as a tardigrade.

Oligochaeta.—The presence of these worms in the digestive tracts was indicated by concentrations of body setae. It was impossible to count the number of individual worms involved. As far as could be determined from these setae, most of the worms present belonged to the genera *Limnodrilus* or *Tubificor*. Except for the species of genera *Coelotanypus* and *Climo-*

tanypus, where from 33–50% of the specimens examined contained worms, these did not seem to be an important component of the food of the Tanypodinae.

Cladocera.—The cladoceran fauna of the digestive tracts of the Tanypodinae is large and varied. Over 16 species representing 10 or more genera were identifiable. There were undoubtedly many more whose remains were broken up or were hidden by debris and could not be identified. Most of the species found belonged to the Chydoridae. This family and corresponding superfamily are, according to Brooks (1959), bottom feeders on particulate matter, thus they would be readily available as food for Tanypodinae larvae. A few head shields of *Bosmina* sp. were found in the larvae examined but I have not included these in the lists. *Bosmina* sp. is primarily a planktonic filter feeder and the head shields were probably of dead specimens picked up with bottom debris. *Procladius* sp. larvae appear to be the most voracious Cladocera predators. Thirteen specimens contained 21 Cladocera with 9 species and 7 genera represented.

Ostracoda.—Most of the shattered ostracod remains were beyond identification due to the grinding action of the debris in the digestive tracts of the larvae. Only occasionally the shells were intact. Morgan (1949) says: "the contents of the midgut are churned up by vigorous muscular movements of the walls." The Ostracoda seem to form an important part of Tanypodinae food and were found in the species of all genera except *Coclotanypus*. At times they seem to have been eaten in great numbers, e.g., 10 specimens were found in the digestive tract of one larva of a species of the *Thienemannimyia* group.

Copepoda.—The copepods were used very sporadically as food of the species of Tanypodinae and cannot be considered an important component. Both the Cyclopoida and Harpacticoida were represented, but not the Calanoida.

Insecta.—The lists show that chironomid larvae form an important part of the food species of Tanypodinae. A total of 15 recognizable genera were found in the digestive tracts of the larvae of Tanypodinae and many specimens were so broken or debris covered that they could be identified only to subfamily or tribe. Members of the Tanytarsini and *Polypedilum* spp. were the most common with the other genera randomly distributed. There is no evidence of any specific or generic preference. Members of the *Thienemannimyia* group of genera seemed to be the most voracious feeders on chironomid larvae with 26 of the specimens examined containing 38 larvae.

Non-chironomid insects as food were scarce. Only a few early instar Trichoptera, one questionable lepidopteran, and one ceratopogonid larva

were found. Morgan (1949) mentions that ceratopogonid larvae are seldom eaten.

Acarina.—The mites, though very numerous in pond type aquatic environments, were not abundant as food of the Tanypodinae larvae examined. Only 5 mites were found in all the specimens seen.

Miscellaneous.—In addition to the aforementioned categories, the digestive tracts of the Tanypodinae larvae contained an assemblage of detritus, gravel, plant parts, unidentifiable eggs, turbellarian egg cocoons, sponge spicules and unidentifiable chitinous fragments. Undoubtedly a great many additional organisms are present in the digestive tracts of the larvae examined but due to the amount of debris and gravel it is not always possible either to find or to identify these. I have found algae (other than Diatoms and Desmids) sporadically and in most cases they were unidentifiable.

Food of Tanypodinae

COELOTANYPODINI

Coelotanypus sp. 15

Diatomaceae 2

Oligochaeta

Limnodrilus or *Tubifex* sp. 5

Cladocera

non-Chydoridae sp. 2—2

Insecta, Diptera, Chironomidae 7—5

sp. 1—1

Polydora sp. 3—2

Chironomus sp. 2—2

Tanytarsini sp. 1—1

Coelotanypus tricolor (Loew) 5

Diatomaceae 1

Oligochaeta

Limnodrilus or *Tubifex* sp. 1

Insecta, Diptera, Chironomidae

sp. 1—1

Coelotanypus concinnus (Coq.) 32

Diatomaceae 10

Oligochaeta

Limnodrilus or *Tubifex* sp. 11

Insecta, Diptera, Chironomidae 4—2

sp. 3—1

Psectrocladius sp. 1—1

Clinotanypus prob. **pinguis** (Loew) 24

Diatomaceae 6

Oligochaeta

Limnodrilus or *Tubifex* sp. 12

Ostracoda

sp. 1—1

Insecta, Diptera, Chironomidae 3—2

sp. 1—1

Sergentia sp. 1—1

Chironomus sp. 1—1

MACROPELOPHINI

Psectrotanypus dyari (Coq.) 13

Diatomaceae 11

Desmidiaceae 4

Cladocera 2—2

Chydoras sp. 1—1

Chydoras sphericus Müller 1—1

Insecta, Diptera, Chironomidae 2—2

Tanypodinae 1—1

Trichocladius sp. 1—1

Natarsia prob. **baltimoreus** (Macq.) 16

Diatomaceae 13

Cladocera

Alonella excisa (Fischer) 1—1

Ostracoda

sp. 4—2

Copepoda

Harpacticoida 1—1

Insecta, Diptera, Chironomidae 2—2

sp. 1—1

Polydora sp. 1—1

Procladius bellus (Loew) 5

Diatomaceae 5

Cladocera

Alona sp. 2—2

Copepoda
 sp. 1—1
 Harpacticoida 2—1
 Ostracoda
 sp. 1—1
 Insecta, Diptera, Ceratopogonidae
 sp. 1—1
 Acarina

sp. 1—1
Procladius spp. (prob. *denticulatus* and
freemani Sublette) 40
 Diatomaceae 38
 Desmidiaceae 1
 Protozoa
Arcella sp. 1—1
Difflugia sp. 3—2

PENTANEURINI

Thienemannimyia Reihe Fittkau 66

Diatomaceae 23
 Desmidiaceae 2
 Protozoa
 Testacea sp. 1—1
 Tardigrada?
 sp. 1—1
 Cladocera 6—3
Alonella hamulata (Birge) 2—1
Alona sp. 2—2
Chydoras prob. *ovalis* Kurz 1—1
 Ostracoda
 sp. 21—8
 Insecta, Diptera, Chironomidae 38—26
 undet. spp. 10—8
Zavrelimyia sp. 1—1
Labrundinia sp. 1—1
Rhectrocladius ? sp. 1—1
Trichocladius sp. 2—2
Psectrocladius sp. 2—2
 Orthoclaadiinae sp. 2—2
Thienemanniella sp. 1—1
Polypedilum sp. 2—2
Chironomus sp. 2—1
Glyptotendipes senilis ? (Joh.) 1—1
 Tendipedini spp. 4—2
 Tanytarsini spp. 5—5

Trichoptera
 spp. 3—3
 Lepidoptera
 poss *Parargyractis* sp. 1—1

Zavrelimyia sp. 7

Diatomaceae 5
 Desmidiaceae 1
 Oligochaeta
Limnodrilus or *Tubifex* sp. 1
 Ostracoda
 sp. 2—1
 Insecta, Diptera, Chironomidae 3—1
 sp. 1—1
Thienemanniella sp. 1—1
Dicrotendipes ? sp. 1—1

Trichoptera
 sp. 1—1
Labrundinia sp. 17
 Diatomaceae 7
 Oligochaeta
Limnodrilus or *Tubifex* sp. 2
 Cladocera
 sp. nr. *Sida* 1—1
 Ostracoda
 sp. 1—1

Ablabesmyia mallochi (Walley) 12

Diatomaceae 5
 Rotifers
Monostyla sp. 1—1
 Oligochaeta
Limnodrilus or *Tubifex* sp. 5
 sp. 1
 Cladocera 7—4
 Chydoridae sp. 2—1
Chydoras sphericus Müller 1—1
Alona sp. 1—1
Alonella hamulata (Birge) 1—1
Camptocercus rectirostris Schödler 1
 —1
Pleuroxus denticulatus Birge 1—1
 Ostracoda
 sp. 2—2
 Insecta, Diptera, Chironomidae 6—4
Harnischia sp. 1—1
Dicrotendipes sp. 1—1
Polypedilum sp. 1—1
Rhectantarsus sp. 1—1
Calopsectra sp. 2—2

Acarina
 sp. 1—1

Ablabesmyia monilis ? (L.) 23

Diatomaceae 7
 Desmidiaceae 1
 Rotifers
Monostyla sp. 2—1
 Oligochaeta
Limnodrilus or *Tubifex* sp. 3

- Cladocera 6—3
Leydigia leydigi (Schödler) 1—2
Chydoras sphericus Müller 1—1
Alonella excisa (Fischer) 1—1
Eurycerus lamellatus Müller 1—1
 sp. 1—1
Alona affinis (Leydig) 1—1
- Ostracoda
 sp. 5—5
- Copepoda
 sp. 1—1
- Insecta, Diptera, Chironomidae 18—11
 spp. 2—2
Zavrelimyia sp. 2—2
 Orthocladinae 2—1
Harnischia sp. 1—1
Microtendipes sp. 1—1
Polypedium scalacnum (Schrank) 1
 —1
 Tanytarsini spp. 6—3
Calopsectra sp.? 3—2
 Trichoptera
 sp. 1—1
- Acarina
 sp. 1—1
- Ablabesmyia peleensis** (Walley) 22
- Diatomaceae 15
 Desmidiaceae 1
 Oligochaeta
Limnodrilus or *Tubificor* sp. 1
- Cladocera 14—10
Alona sp. 1, 4—3
Alona sp. 2, 1—1
Alona circumfimbriata (Megard) 1
 —1
Chydoras sphericus (Müller) 7—6
 Chydoridae sp. 1—1
- Ostracoda
 sp. 14—6
- Copepoda
 Cyclopoidea 1—1
- Insecta, Diptera, Chironomidae 20—9
 undet. spp. 5—4
Thienemanniella sp. 3—1
Cricotopus bicinctus ? (Meig.) 3—1
Orthocladus nr. *nivoriundus* (Joh.)
 1—1
 Orthocladinae sp. 1—1
Dicortendipes sp. 2—2
Polypedium illinoense (Mall.) 3—1
 Tanytarsini sp. 2—2
Ablabesmyia monilis ? (L.) 1—1

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